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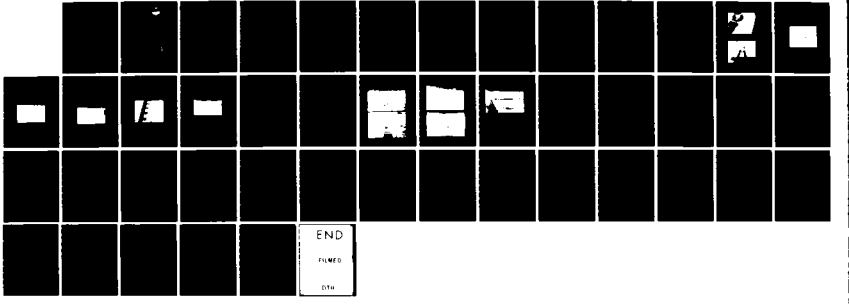

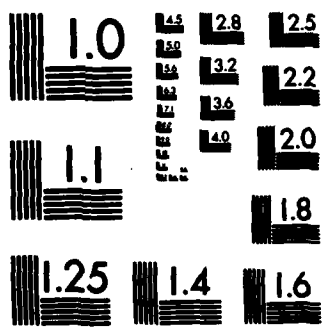

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USAF OEHL REPORT

84-296EQ305HSB

AD-A146 152

WASTEWATER TREATMENT PLANT EVALUATION

OTIS ANG BASE MA

USAF Occupational and Environmental Health Laboratory
Aerospace Medical Division (AFSC)
Brooks Air Force Base,Texas 78235

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JOHN L. COUGHLIN, Colonel, USAF, BSC
Commander

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The USAF OEHL conducted an on site wastewater treatment plant evaluation survey at Otis (ANG) Base from 16-21 Mar 84, at the request of ANGSC/SGB. The survey was requested because the base is negotiating a National Pollutant Discharge Elimination System (NPDES) permit with the State of Massachusetts, Division of Water Pollution Control. Data was needed to show the current operating efficiency of the plant. Specific concerns of the base were disinfection of the effluent and plant removal of nutrients such as nitrogen and phosphorus. Results of the survey indicate that the plant is able to meet current effluent limitations except for total coliform bacteria. However, future limitations which will include forms of nitrogen may not be met during the winter months when low temperatures adversely affects oxidation of nitrogen. Recommendations were made to: (1) provide a contact chlorination tank for adequate disinfection; and (2) consider methods to increase the organic content of wastewater reaching the trickling filter.

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USAF OCCUPATIONAL AND ENVIRONMENTAL

HEALTH LABORATORY

Brooks AFB, Texas 78235

Wastewater Treatment Plant Evaluation

Otis ANG Base MA

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ACKNOWLEDGEMENTS

The authors greatly appreciate the valuable assistance provided by the following USAF OEHL/ECQ personnel during this survey:

A1C Glen S. Wheeler, Water Quality Technician
A1C Tammy W. Johnson, Water Quality Technician

We also acknowledge the cooperation and support provided by personnel at the Otis ANG Base Wastewater Treatment Plant.

I. INTRODUCTION

On 3 Feb 84, the Air National Guard Support Center (ANGSC/SGB), Andrews AFB, Washington DC, requested the USAF Occupational and Environmental Health Laboratory (USAF OEHL) conduct an on-site wastewater treatment plant (WTP) survey to evaluate the efficiency of the plant. In addition, they requested USAF OEHL provide the materials necessary to collect, preserve and ship water samples from five monitoring wells at the site. A survey was conducted at Otis ANG Base between 16 and 21 Mar 84 to accomplish these tasks.

The objectives of the survey were to: (1) characterize the wastewater influent, (2) determine the loadings and removal efficiencies of the plant, (3) identify problem areas, and (4) recommend possible solutions. The parameters of particular interest to the base were Ammonia-Nitrogen, Nitrate-Nitrogen, Biochemical Oxygen Demand (BOD), Phosphorus, Iron, Alkalinity, Sodium, Total Dissolved Solids (TDS), Total Kjeldahl Nitrogen, and Coliforms.

II. BACKGROUND

A. Introduction

Otis ANG Base, home of the 102 Fighter Interceptor Wing, is approximately 60 miles southeast of Boston MA. The effective population was approximately 2,600 during the survey. The population increases to an average of about 3,500 during the summer months when troops arrive for training.

Climatic data for Otis includes an annual daily maximum temperature of 57°F and a mean precipitation of 47.8 inches. Precipitation during the survey averaged 0.25 inches/day. Daily production of drinking water during the same period averaged 434,750 gallons per day (gpd).

The WTP has been in operation since 1941. The plant underwent major modifications to the flow meters, discharge valves and reconstruction of sand beds in Sep 83. The facility consists of a comminutor, parshall flume, skimming tank, Imhoff tank, two high rate trickling filters, two final settling tanks, sand filters (percolation beds) and sludge drying beds. A flow diagram of the plant is shown in Figure 1, which excludes the sludge drying beds.

Flow data from Oct 81 to Mar 82 indicate that the average wastewater volume treated was 0.5 million gallons daily (mgd) with a peak flow of 1.0 mgd. The new flow meters indicate the average flow is closer to 0.3 mgd, with a peak flow of approximately 0.6 mgd.

B. Facility Description

All the influent wastewater flows through the bar screen or comminutor shown in Photo 1. Our flow measuring device was installed adjacent to the parshall flume as shown in Photo 2. The parshall flume is 9 inches in width.

WASTEWATER TREATMENT FACILITY
PROCESS FLOW DIAGRAM

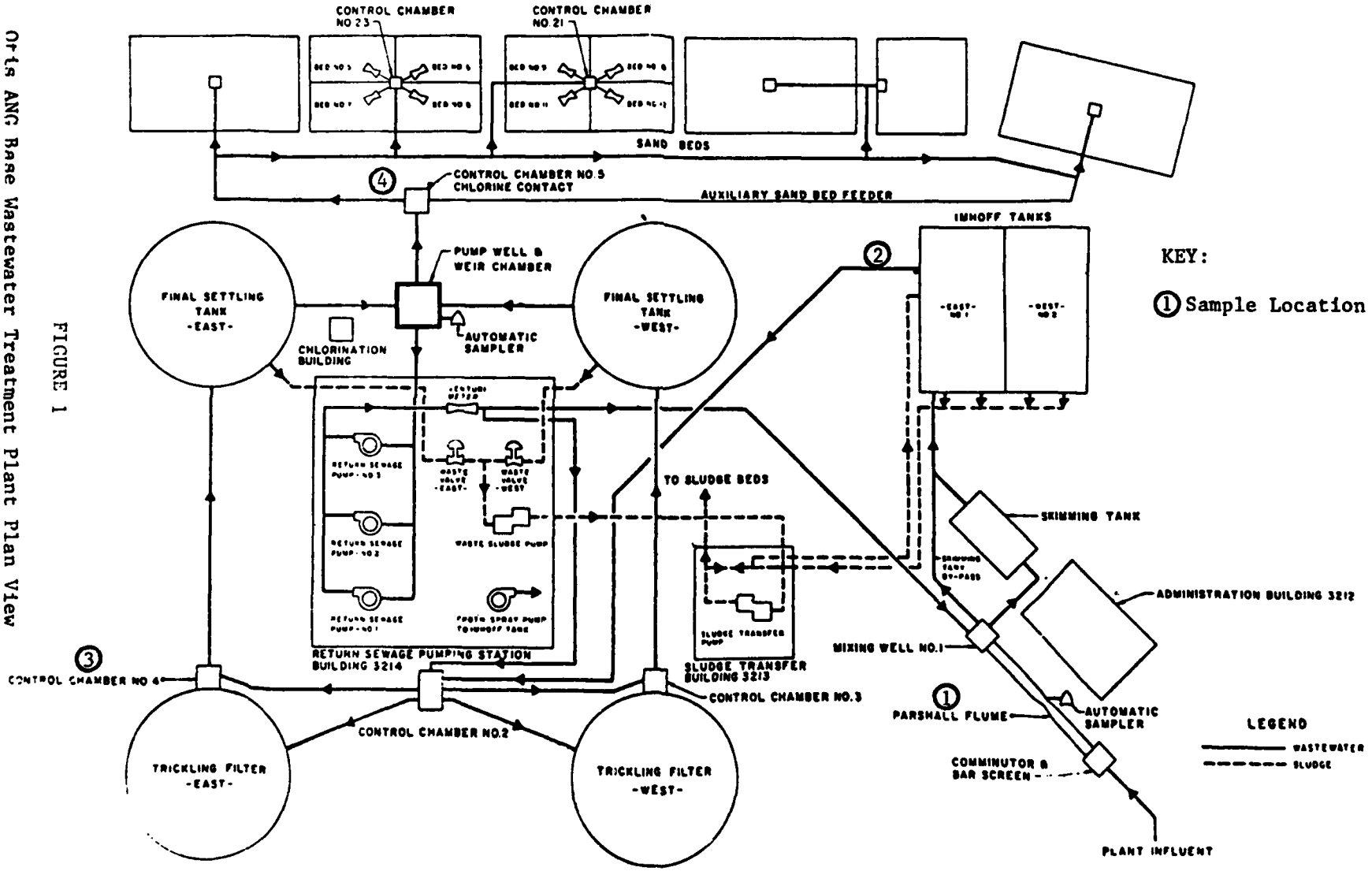


FIGURE 1

Orla ANG Base Wastewater Treatment Plant Plan View

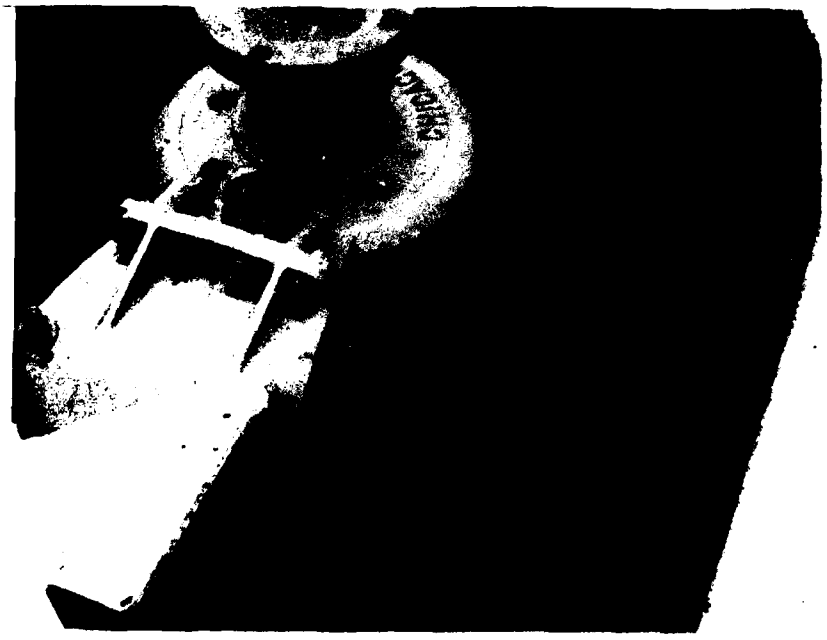


Photo 1: Bar screen and Comminutor, Otis ANG Base Wastewater Treatment Facility, Mar 84.

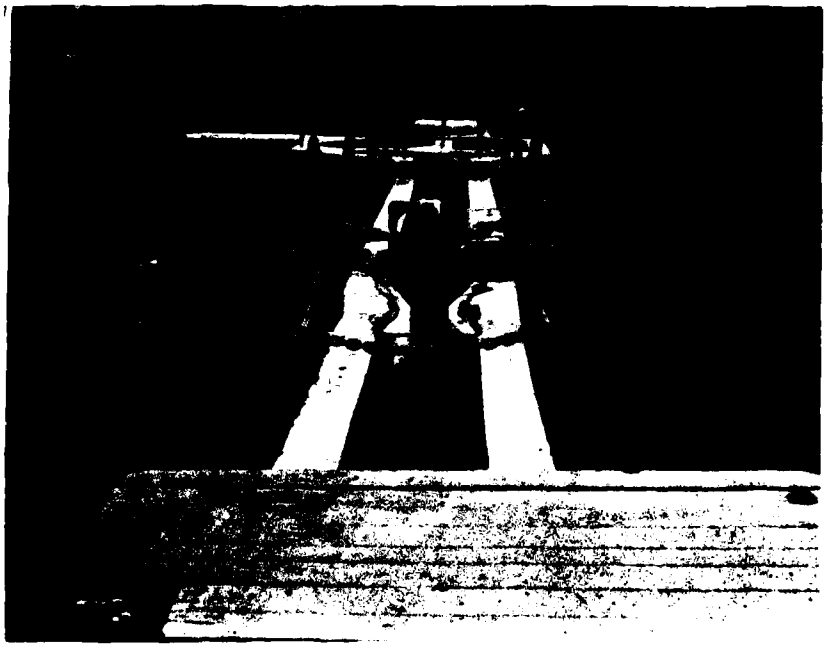


Photo 2: Parshall Flume, Otis ANG Base Wastewater Treatment Facility, Mar 84.

The purpose of the skimming tank, shown in Photo 3, is to remove oil and grease and other floating materials from the wastewater before further treatment. Compressed air is used to aid in the formation of floating materials and prevent deposition of solids.

Photo 3: Grease Skimming Tank, Otis ANG Base Wastewater Treatment Facility, Mar 84.

The Imhoff tanks, shown in Photo 4, are designed to remove settleable solids and digest the accumulated sludge. The frequency of sludge removal from the Imhoff is estimated to be once a year. The Imhoff tanks have a volume of 153,000 gal and a surface area of 4,500 ft^2 each.

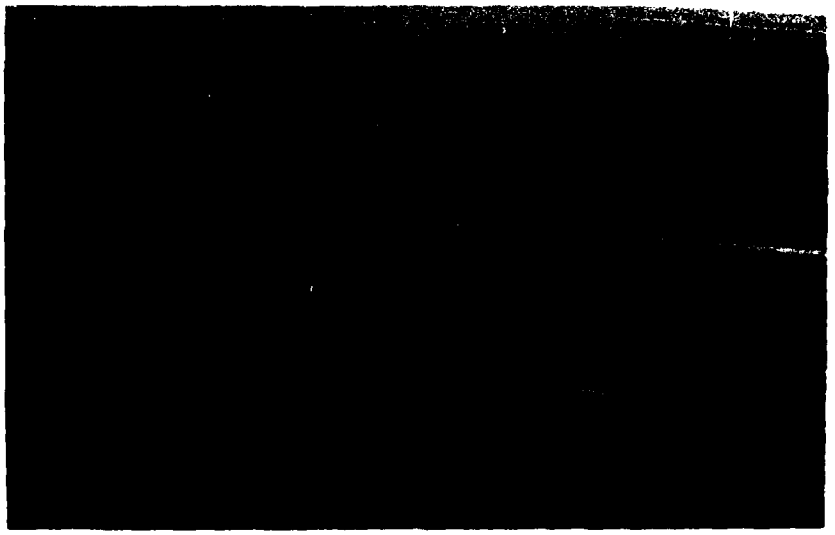


Photo 4: Imhoff Tanks, Otis ANG Base Wastewater Treatment Facility, Mar 84.

The effluent from the Imhoff tanks drains into one of two high rate trickling filters (see Photo 5). Each trickling filter has a surface area of 7,854 ft^2, a filter media depth of 3 feet and a filter media volume of 23,560 ft^3. They are designed for a hydraulic loading of approximately 16 mgd/acre-ft (367 gpd/ft^4) and an organic loading of 25-300 lbs BOD/1000 ft^3 day. Photo 6 shows the stone media used in the trickling filter, and the nozzles which distribute the wastewater over the media.

Photo 5: East Trickling Filter, Otis ANG Base Wastewater Treatment Facility, Mar 84.

Photo 6: Filter Media, Otis ANG Base Wastewater Treatment Facility, Mar 84.

The effluent of the trickling filter then enters the final settling tank, which is a circular upflow unit (see Photo 7). The tank has a volume of 257,000 gal, a surface area of 4,299 ft^2, and a weir length of 233 ft. A portion of the effluent is recirculated to the Imhoff tank (see "Results and Discussions" section).

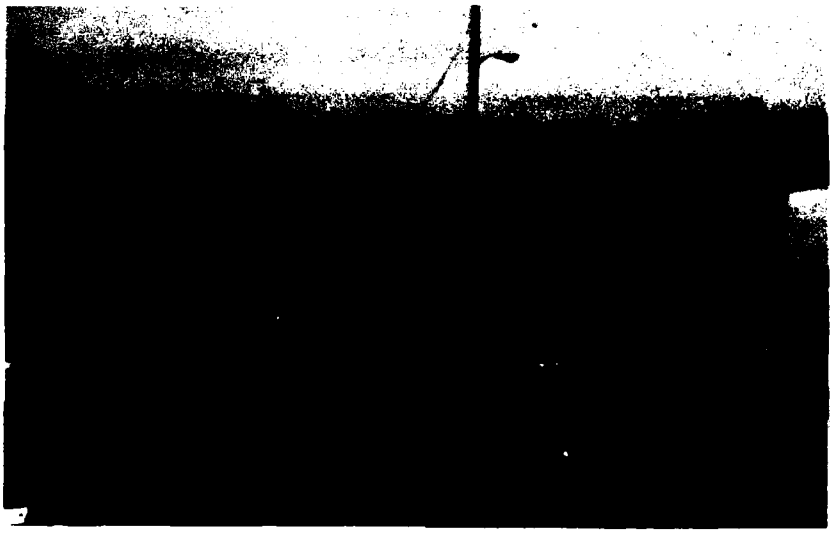


Photo 7: East Final Setting Tank, Otis ANG Base Wastewater Treatment Facility, Mar 84.

The recirculation flow is controlled by three pumps. The capacities of the pumps are 1,000, 2,000 and 3,000 gallons per minute (gpm). Pumps can be operated separately or together, as the influent wastewater volume varies, to optimize the treatment process. The 2,000 gpm pump is normally used by plant operators. On March 20 the 2,000 gpm recirculation pump was shut down and the 1,000 gpm pump was put into operation. This was done primarily to reduce the hydraulic loading of the trickling filter and to increase the detention time in the final settling tanks. The biomass on the trickling filter media was not able to acclimate to this new loading in the remaining time of the survey. Normally, several weeks are required for a biological system to adapt to new steady state conditions. However, it did show that the lower loading could evenly distribute flow throughout the day.

Recent modifications to the facility included equipment to chlorinate but not the installation of a chlorine contact tank. Chlorine is not presently being added. The travel time in the distribution pipes to the sand filters provides "contact time" for disinfection. Civil Engineering personnel have determined that at a flow rate of approximately 250,000 gpd, the time of travel in the distribution lines, was 24 minutes. However, mixing may not be sufficient for effective disinfection.

The effluent from the plant discharges to a natural sand formation (Photos 8-11) and becomes groundwater recharge. Photos 8 and 9 show four old sand beds that were in use before the plant modification (beds 1 through 4 in Figure 2). A new piping system was installed and eight sand beds rehabilitated to use a larger segment of the formation and to increase the capacity for discharge (Photos 10 and 11). This added eight new sand beds (No. 5 through 12), each with a capacity similar to the old beds of 100,000 gpd. Use of beds 1 through 4 will be discontinued. Therefore, the total capacity will be approximately 0.8 mgd.

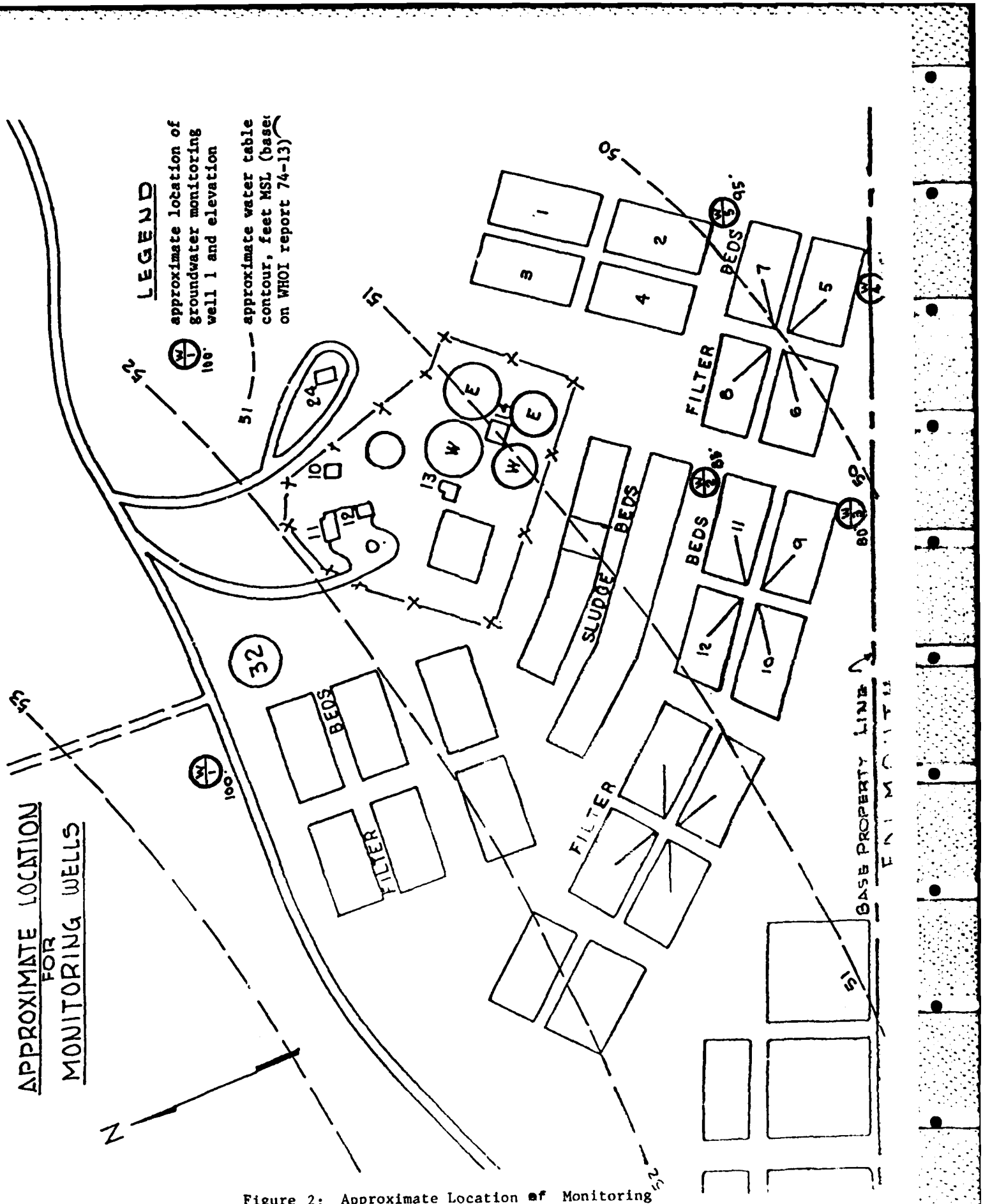
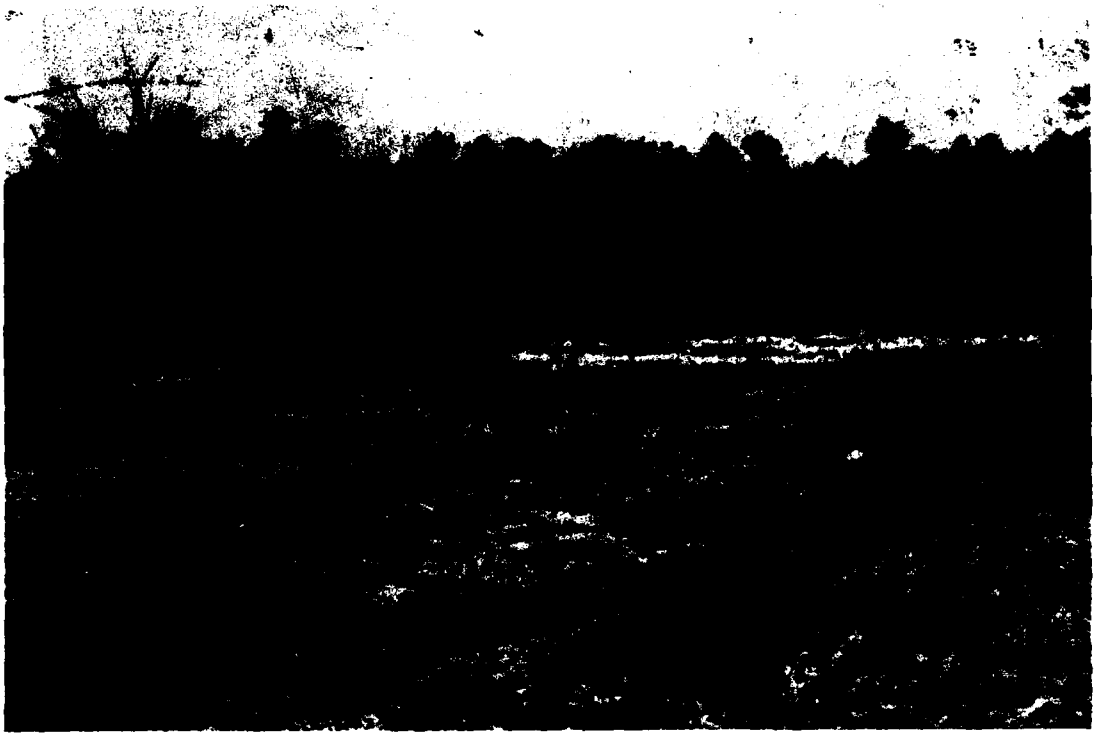


Figure 2: Approximate Location of Monitoring Wells, Otis ANG Wastewater Treatment Facility, March 1984



Photos 8-9: Old Sand Beds, Otis ANG Base Wastewater Treatment Facility, Mar 84.

Photos 10-11: Rehabilitated Sand Beds, Otis ANG Base Wastewater Treatment Facility, Mar 84.

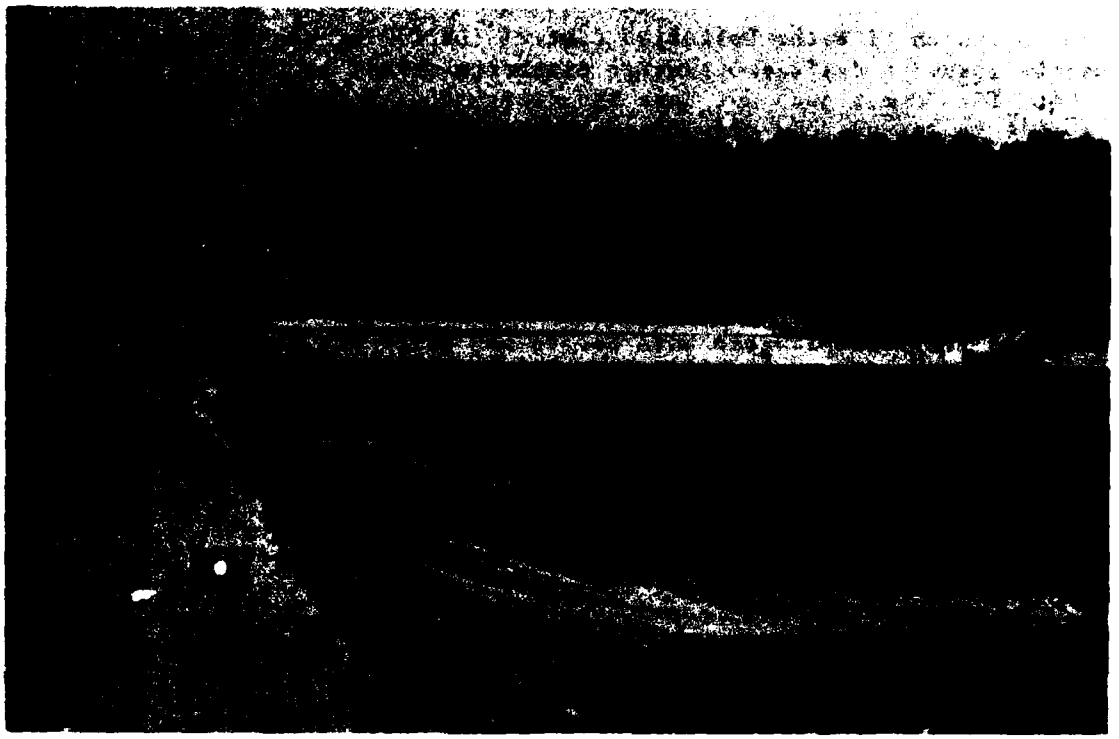


Photo 12: Sludge Drying Beds, Otis ANG Base Wastewater Treatment Facility, Mar 84.

Until Jun 84, effluent from the facility was distributed to only one of the old sand filters at a time. The effluent was alternated between beds 3 and 4 principally, and infrequently to beds 1 and 2 (see Photo 3). The period that one particular bed was used varied from one week to several months, with no real criteria used for switching to another bed. Beginning Jun 84, the effluent will be distributed to the eight rehabilitated sand beds (Figure 2). The method of distributing the effluent will be changed so that only 5 gal/ft²/day of effluent will pass through a filter (a decrease from the 15-20 gal/ft²/day now applied). The distribution mechanism was automated to facilitate this operation.

Sludge from the Imhoff tank is discharged to a new sludge drying bed and a leachate collection pond that has a 50,000 gal capacity (Figure 2). Each has a surface area of approximately 4,500 ft². Leachate that is collected is pumped to the Imhoff tank. The weather dried sludge is disposed of in the sanitary landfill located on base. Base personnel are in the process of bringing the landfill into compliance with state requirements.

C. Groundwater Monitoring Requirements

The Division of Water Pollution Control (DWPC) for the State of Massachusetts issued a draft groundwater discharge permit to Otis ANG Base on 9 Mar 84. The permit does not have the "weight" of an interim or final permit, but it is intended to provide a starting point for all concerned to reach an equitable arrangement. The DWPC determined that the "operation of the wastewater facility has resulted in the extension of an effluent plume zone of influence whose impact has led to the closure of a Falmouth municipal water supply source." A specific concern of the DWPC is the inadequate disinfection of the effluent, and they require the facility to be upgraded. Other concerns are the discharge of nitrogen and phosphorus. The discharge permit issued includes limits applicable both before and after any required modifications (see Table I). Some parameters specified to be monitored after modifications have been made did not have limits established and/or sampling technique specified.

Otis ANG Base is also required to monitor five monitoring wells located as shown in Figure 2. These wells were installed as the result of a memorandum of agreement (MOU) between the U.S. Environmental Protection Agency and the Air Force on 31 Aug 83. The U.S. EPA was concerned about nitrate levels in the groundwater that may result from the effluent of the facility. Well installation was completed in Dec 84 and they are sampled on a weekly basis in accordance with the MOU.

The DWPC Draft Discharge Permit, in addition to the effluent requirements, also requires at least three wells to be installed to monitor the sand beds. The analyses required are shown in Table II. Maximum contaminant levels have not been set by the state for these parameters. The wells installed as a result of the MOU may also fulfill the state's requirements.

III. METHODS AND MATERIALS

Influent flows were monitored continuously using a Manning F-3000A flowmeter. The flow measuring device was calibrated at 6.03 inches maximum liquid level. The plant ultrasonic level transmitter flow measuring device was also installed in the parshall flume. Recirculation flow rates were determined from the digital flow meter at the pump locations.

Four sampling locations were established in the treatment facility. These sites are listed in Table III and shown in Figure 1. Collection of daily composite samples was accomplished at Stations 1-4. Equipment used for this purpose were the ISCO Automatic Wastewater Composite samplers, Model 2100 and 1580. Also, daily grab samples were collected for those analyses requiring this type of collection.

Our team performed BOD-5, total suspended solids, total dissolved solids, total coliform, orthophosphate, pH, temperature, and dissolved oxygen tests on-site. Other chemical analyses were conducted at the USAF OEHL, Brooks AFB TX. Unit processes and operations were evaluated mainly by determining BOD-5 and TSS reduction because design criteria are available for these parameters.

Chemical analyses for the water samples collected from the monitoring wells were also conducted at USAF OEHL. All analyses were performed in accordance with Standard Methods for the Examination of Water and Wastewater, 15th Ed., 1980 and U.S. EPA approved analytical methods.

Table I

Draft Discharge Permit Requirements for Otis ANG Base Wastewater Treatment Plant, 9 Mar 84

Effluent Characteristics	Discharge Limitations Modification Before	Modification After	Sampling Freq.	Sampling Type*
Flow cu. m/day (mgd)	0.8	0.8	daily	weir
Biochemical Oxygen Demand-5 day (mg/L)	30	30	2 x week	8-comp
Total Suspended Solids (mg/L)	30	30	2 x week	8-comp
Total Coliform Bacteria (organisms/ 100 mL)	1000	1000	weekly	grab
Settleable Solids (mL/L)	0.1	0.1	daily	grab
pH (units)	6.5-8.5	6.5-8.5	daily	grab
Nitrate-Nitrogen as N (mg/L)	NA	10.0	weekly	8-comp
Total Nitrogen as N (mg/L)	NA	10.0	**	**
Total Kjeldhal Nitrogen as N (mg/L)	NA	NA	monthly	8-comp
Ammonia as N (mg/L)	NA	NA	weekly	8-comp
Phosphorus (mg/L)	NA	1.0	**	**
Oils & Grease (mg/L)	NA	15.0	**	**
Fluoride (mg/L)	NA	2.4	**	**
Chlorine (mg/L)	NA	1.0	daily	grab
Boron (mg/L)	NA	20.0	monthly	grab
MBAS (mg/L)	NA	1.0	monthly	8-comp

*8-comp refers to 8-hour composite samples
**Effluent standard was included in the permit but sampling information was not.

Table II

Draft Discharge Permit Requirements for Otis ANG Base Monitoring Wells, 9 Mar 84

Chemical Analysis	Sampling Frequency
Arsenic	1 x annually
Total Trihalomethanes	1 x annually
Lead	1 x annually
Mercury	1 x annually
Ammonia Nitrogen	1 x monthly
Nitrate Nitrogen	1 x monthly
Nitrite Nitrogen	1 x monthly
Sodium	1 x monthly
pH	1 x monthly
Specific Conductance	1 x monthly
Chloride	1 x monthly
Static Water Level	1 x monthly
Total Dissolved Solids	1 x annually
MBAS	1 x annually
Total Coliform	1 x annually
Barium	1 x annually
Cadmium	1 x annually
Chromium	1 x annually
Selenium	1 x annually
Silver	1 x annually
Total Phosphorus	1 x annually
Boron	1 x annually
Total Volatile Organics	1 x annually
Iron	1 x annually
Manganese	1 x annually

Table III

Sample Locations Used for the Wastewater Treatment Plant Evaluation Otis ANG Base, March 1984

Station	Location*
1	Influent
2	Imhoff Tank Effluent
3	Trickling Filter Effluent
4	Final Settling Tank Effluent

*see Figure 1

IV. RESULTS AND DISCUSSIONS

A. Flow Measurements

The average daily influent flow rate was found to be 0.23 mgd (159 gpm), which represents a water use rate of approximately 90 gal/capita-day. The correlation between our flow measuring device and the facility's flow recorder was excellent. Figure 3 shows the average hourly variation in the influent flow rate which is typical of a small community.

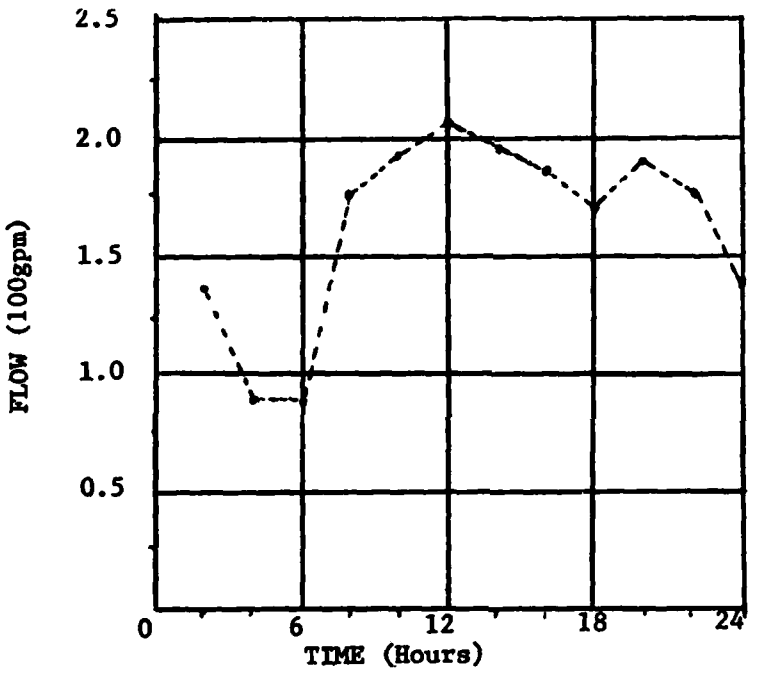


Figure 3. Average Hourly Influent Flow Rates, Otis ANG Base Wastewater Treatment Facility Evaluation, Mar 84

The recirculation flow while the 2,000 gpm pump was running was 2.25 mgd (1,560 gpm) and averaged 1.68 mgd (1,170 gpm) when the 1,000 gpm pump was operating. Therefore, the average total flow through the facility itself was 2.48 mgd with the 2,000 gpm pump and 1.91 mgd with the 1,000 gpm pump.

The recirculation ratio (the recirculated flow to the average influent flow) was 9.8 for the 2000 gpm pump and 7.3 for the 1000 gpm pump. The normal range for recirculation ratios is 0.5 to 4.0. A ratio of greater than 4 does not materially increase the efficiency of the filters(1). The high recirculation rate is necessary, however, at Otis because the hydraulic loading through the trickling filters needs to be maintained (see Section IV.C.).

B. Wastewater Characterization

Table IV summarizes the results of the chemical analyses requested by the base from samples taken during the survey. The wastewater entering the facility can be characterized as a light strength municipal waste, with average organic content, as indicated by the BOD-5 concentration of 130 mg/L.

C. Facility Performance

The removal efficiencies for each process are shown in Table IV. Overall removal of BOD-5 and TSS were 89 and 97 percent, respectively, which is unusually high for this type of plant. These high removal efficiencies may be because the organics are in a suspended solid form, or particles (which are more amenable to removal by sedimentation) rather than a soluble form which would require biological oxidation. The results, however, also indicate that the high recirculation rate to the Imhoff diluted the influent wastewater. Because of the dilution, the trickling filter/secondary clarifier efficiency was reduced. This is shown by the removal of only 27 percent of the BOD-5 through these processes. According to the NRC Formula (1) (developed as a result of extensive analysis of operational records of stone media filters serving military installations), the efficiency should have been approximately 85 percent. The reduced efficiency was probably due to the low BOD-5 concentration entering the trickling filter (only 18 mg/L). The reduced performance of the trickling filter is also important when considering the other chemical parameters, such as ammonia and phosphorus.

The parameters which exceeded the permit standards were Total Kjeldahl Nitrogen (TKN), Total Phosphorus and coliforms. Ammonia represents all of the organic nitrogen entering the plant (TKN equals Ammonia, which is included in the TKN analyses). Only 34 percent of the influent ammonia was oxidized during treatment. The poor oxidation of ammonia is largely due to the less than optimum environmental conditions or parameters. Three of these important parameters in the nitrification process (ammonia oxidation) are temperature, pH and detention time. Optimum pH is near 8.4, and the nitrification rate is reduced at temperatures of about 8°C. Three years of operational data indicate a seasonal variation in the degree of nitrification due to fluctuations in temperature. Appendix I shows the results of on-site analyses. Temperature values were less than 8°C and the pH averaged approximately 7.5. The nitrification process was further hindered by the reduced detention time provided by a high rate trickling filter.

Phosphorus and coliforms were not reduced in the facility because the processes and operations necessary to do so are not used at the plant. Chemical precipitation would be necessary to reduce phosphorus, and chlorination (or other suitable disinfectant) is necessary to reduce the coliform count. (The coliform analyses show an average of 332,233 colonies/100 mL was in the effluent).

Table IV

Unit Process Removal Efficiencies for Otis ANG Base Wastewater Treatment Facility, March 1984*

Parameter	STATION 1	2	3	4	Present Standards	% Removal
BOD-5	130	18	13	13	30	90
Nitrogen, Total Kjeldahl	27	20	18	18	NA	33
Ammonia	27	20	17	17	NA	37
Nitrate	2	2	2	2	NA	0
Total phosphorus (as P)	4	4	3	4	NA	0
Ortho-phosphate (as P)	23	23	23	23	NA	0
TSS	120	14	4	4	30	97
TDS	103	93	80	107	NA	NA
Iron	0.56	0.25	0.34	0.23	NA	59
Sodium	36	37	37	36	NA	NA
Alkalinity	98	57	43	25	NA	NA
Coliforms	NA	NA	NA	338,333	1,000	NA

*All units are mg/L except coliform which is colonies/100 mL.

The facility was further evaluated by determining the loading parameters shown in Table V. The values were calculated using both recirculation rates for comparison. In general, the 2,000 gpm recirculation rate resulted in better loadings than the 1,000 gpm pump. All loadings, however, could be considered normal, except for the organic loading of the trickling filter. This result helps substantiate the earlier findings of reduced BOD-5 removal in the trickling filter, and most likely contributed to the unfavorable environmental conditions in limiting the reduction of the ammonia concentration.

D. Well Data

The analytical results of the well samples taken during the survey are given in Appendix II. Samples were taken at five points in the well. These values are averaged for each well and are presented at the end of the Appendix.

Table V

Unit Process Loading Parameters for Otis ANG
Wastewater Treatment Facility, March 1984

Process	Units	Actual Loading Recirculation 2,000	Actual Loading Recirculation 1,000	Recommended Loading*
Imhoff tank				
Surface Loading	gpd/ft²	551	424	500-700
Detention Time Avg.	hours	1.5	2.0	1.5-2.5
Trickling Filter				
Hydraulic Loading	gpd/ft²	315	243	230-900
Organic Loading	lbs BOD-5/day/ 1000-ft³	16	12	25-300
Final Settling Tank				
Surface Loading	gpd/ft²	577	444	500-700
Weir Loading	gpd/ft	10,644	8197	<15,000

*Water Pollution Control Federation

V. OBSERVATIONS AND CONCLUSIONS

A. The plant is meeting all current applicable draft permit requirements (Table I, "before") except total coliform bacteria.

B. The facility may not meet future permit requirements for Total Nitrogen and phosphorus, unless modifications are made to either the facility or the permit requirements. In addition, the chemicals monitored did not include oil and grease, fluoride, boron or MBAS. Therefore, conclusions concerning these chemicals cannot be made at this time.

C. The plant is under utilized even when considering the increased flows that occur in the summer months. Half the plant can handle 1.5 mgd, and the average influent flow was found to be only 0.23 mgd.

D. There are sufficient controls, i.e., recirculation pumps, to handle varying waste loads.

E. The recirculation rate, while providing good hydraulic loading, is excessive and dilutes the organics concentration, i.e., BOD, which is necessary for optimum efficiency of the trickling filter.

F. The lack of disinfection is causing excessive coliform counts.

VI. RECOMMENDATIONS

A. Continue discussions with the state to obtain agreeable standards for the permit, especially for phosphorus and coliforms.

B. Consider the installation of a chlorination tank, not only to reduce coliform counts, but also to aid in the oxidation of ammonia (and, therefore, TKN) during the winter months. A chlorination tank would probably provide better conditions for disinfection and ammonia reduction, because of the increased mixing provided by a baffle system. If a unit is installed, at least 20 minutes contact time should be provided.

C. By-passing some of the flow through the Imhoff tank or reducing the detention time in the Imhoff should be considered in order to increase the organic loading to the trickling filter. This should increase the organic loading on the filter and stimulate the growth of biomass. Better assimilation of phosphates should result.

D. In the future if the final discharge permit includes oil and grease, fluoride, boron, and MBAS, the USAF OEHL can provide sample containers and analytical services for these analyses.

References

1. Water Pollution Control Federation, "Wastewater Treatment Plant Design," MOP-8, 1977.

2. "Standard Methods for the Examination of Water and Wastewater," 15th Edition, 1980.

LIST OF ABBREVIATIONS

1.	ANG	-Air National Guard
2.	ANGSC	-Air National Guard Support Center, Andrews AFB MD 20331
3.	BOD-5	-Five day, 20°C, Biochemical Oxygen Demand
4.	ft^2	-Square feet
5.	ft^3	-Cubic feet
6.	FIW	-Fighter Interceptor Wing
7.	gal	-gallons
8.	gpd	-gallons per day
9.	gpm	-gallons per minute
10.	in	-inches
11.	lbs	-pounds
12.	MBAS	-Methylene Blue Alkyl Sulfonates
13.	mgd	-million gallons per day
14.	mg/L	-milligrams per liter
15.	mL	-milliliters
16.	NRC	-National Research Council
17.	TDS	-Total Dissolved Solids
18.	TSS	-Total Suspended Solids
19.	µg/L	-micrograms per liter
20.	U.S. EPA	-United States Environmental Protection Agency
21.	USAF OEHL	-United States Air Force Occupational and Environmental Health Laboratory, Brooks AFB TX 78235
22.	WTP	-Wastewater Treatment Plant

APPENDIX I

ON-SITE ANALYTICAL TESTS RESULTS OTIS ANG BASE WASTEWATER PLANT EVALUATION, MARCH 1984

On-Site Analytical Tests Results
Otis ANG Base Wastewater Plant Evaluation, March 1984

Date	Site	BOD_5	TSS*	TDS*	Ortho-Phosphate*	pH	Temp (°C)	Coliforms (No. colonies/ 100 mL)
19 Mar	Influent	156	101	104	27	7.2	7.6	NA
	Imhoff Tank Effluent	—	11	101	25	7.4	4.9	NA
	Trickling Filter EFF.	16	3	91	25	7.4	5.5	NA
	Final Settling Tank EFF.	18	6	112	25	7.3	6.2	345,000
20 Mar	Influent	146	158	92	21	7.2	7.5	NA
	Imhoff Tank Effluent	—	30	56	22	7.4	7.0	NA
	Trickling Filter EFF.	12	7	77	21	7.4	6.5	NA
	Final Settling Tank EFF.	15	4	81	21	—	6.5	310.833
21 Mar	Influent	108	96	69	23	7.5	7.5	NA
	Imhoff Tank Effluent	—	—	45	25	7.4	7.2	NA
	Trickling Filter EFF.	12	—	56	23	7.4	7.0	NA
	Final Settling Tank EFF.	11	—	89	24	7.4	7.1	336.666
22 Mar	Influent	109	149	137	23	7.5	7.5	NA
	Imhoff Tank Effluent	15	4	116	25	7.4	7.2	NA
	Trickling Filter EFF	12	3	94	23	7.4	7.0	NA
	Final Settling Tank EFF	10	1	109	24	7.4	7.1	363.333
23 Mar	Influent	126	97	113	20	—	—	NA
	Imhoff Tank Effluent	20	10	145	19	—	—	NA
	Trickling Filter EFF.	13	3	81	20	—	—	NA
	Final Settling Tank EFF.	12	3	146	19	—	—	335.833

*Units are mg/L

APPENDIX II

WELL SAMPLING ANALYTICAL RESULTS OTIS ANG BASE WASTEWATER PLANT EVALUATION, MARCH 1984

Well Sampling Analytical Results, Otis ANG Base Wastewater Plant Evaluation, March 1984

DATE	SITE	NITRATE	PHOSPHORUS	AMMONIA	*IRON	*COPPER	SODIUM	CHLORIDE	SULFATE	(MBAS)
21 Mar	Well 1	0.90	.20	0.2	4,163	22	6.9	12	9	0.1
	2 feet									
	10 feet	0.92	.10	0.2	562	20	6.5	12	9	0.1
	20 feet	0.92	0.35	0.2	457	20	6.5	12	31	0.1
	30 feet	0.88	0.33	0.2	1,989	20	6.2	12	14	0.1
	34 feet	0.60	1.4	0.2	34,900	111	6.2	8	13	0.1
	Well 2									
	2 feet	4.5	0.10	0.2	100	153	8.7	16	27	0.1
	10 feet	7.5	0.10	0.2	100	114	9.6	16	9	0.1
	20 feet	7.0	0.10	0.2	100	63	8.5	16	9	0.1
	30 feet	4.5	0.10	0.2	100	116	8.8	16	15	0.1
	40 feet	5.25	0.10	0.2	100	144	9.4	12	20	0.1
	Well 3									
	2 feet	0.96	6.25	0.2	30,380	21	10.5	8	34	0.1
	10 feet	0.70	3.0	1.3	15,590	20	12.1	12	47	0.1
	20 feet	0.14	2.9	0.4	15,250	20	12.1	12	37	0.1
	30 feet	0.16	3.0	0.2	16,800	20	10.0	12	39	0.1
	40 feet	1.2	0.74	0.2	4,158	20	12.1	16	66	0.1
20 Mar	Well 4									
	2 feet	1.2	1.1	1.4	5,520	20	20.0	8	22	0.1
	12 feet	0.1	0.49	1.8	7,340	20	23.4	16	27	0.1
	20 feet	0.1	7.0	3.2	7,270	20	24.0	16	28	0.1
	30 feet	0.1	7.5	0.3	9,720	20	24.7	16	24	0.1
	36 feet	0.1	24.0	0.3	55,940	80	26.7	12	27	0.1
	Well 5									
	2 feet	4.5	0.12	0.2	469	43	29.7	68	27	0.1
	10 feet	5.0	0.17	0.5	100	20	32.4	60	29	0.1
	20 feet	5.25	0.47	0.5	100	20	31.4	60	27	0.1
	30 feet	5.0	0.60	0.2	527	20	31.3	28	27	0.1
	40 feet	5.25	0.80	1.1	2,311	20	32.0	28	28	0.1

AVERAGE CONCENTRATIONS (mg/L)

SITE	NITRATE	PHOSPHORUS	AMMONIA	*IRON	*COPPER	SODIUM	CHLORIDE	SULFATE	SURFACTANTS (MBAS)
Well 1	0.84	0.48	0.2	8,414	38.6	6.5	11.2	15.2	0.1
Well 2	5.75	0.10	0.2	100	118.0	9.0	15.2	16.0	0.1
Well 3	0.63	3.18	0.46	16,435.6	20.2	11.36	12.0	44.6	0.1
Well 4	0.32	8.02	1.40	17,158	32.0	23.76	13.6	25.6	0.1
Well 5	5.00	0.43	0.50	701	24.6	31.4	48.8	27.6	0.1

*µg/L, all other units are mg/L

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 24 Apr 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY: WATER Well No. 1

DATE RECEIVED: 27 Mar 84

SAMPLE FROM: Otis ANG Base, MA

LAB CONTROL NR:

TEST FOR: VOLATILE HALOCARBONS

METHODOLOGY: EPA METHOD 601

OEHL #	16485	16486	16487	16488	16489	DET.
BASE #	GN840221	GN840222	GN840223	GN840224	GN840225	LIMIT
Bromodichloromethane	ND	ND	ND	ND	ND	0.1
Bromoform	ND	ND	ND	ND	ND	0.2
Bromomethane	ND	ND	ND	ND	ND	1.0
Carbon Tetrachloride	ND	ND	ND	ND	ND	0.1
Chlorobenzene	ND	ND	ND	ND	ND	0.2
Chloroethane	ND	ND	ND	ND	ND	0.5
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	0.1
Chloroform	ND	ND	ND	ND	ND	0.1
Chloromethane	ND	ND	ND	ND	ND	0.1
Dibromochloromethane	ND	ND	ND	ND	ND	0.1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
Dichlorodifluoromethane	ND	ND	ND	ND	ND	0.1
1,1-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,2-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,1-Dichloroethene	ND	ND	ND	ND	ND	0.1
trans-1,2-Dichloroethene	9.3	1.8	ND	ND	ND	0.1
1,2-Dichloropropane	ND	ND	ND	ND	ND	0.1
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
Methylene Chloride	ND	ND	ND	ND	ND	0.2
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	0.1
Tetrachloroethylene	20	3.4	ND	ND	ND	0.1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	0.1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	0.1
Trichloroethylene	5.1	0.9	ND	ND	ND	0.1
Trichlorofluoromethane	ND	ND	ND	ND	ND	0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LeROY P. GEORGE, GS-12
Chief, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

BROOKS AFB TX

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD (General)	DATE 25 Apr 84
TO:	FROM: USAF OEHL/SA Brooks AFB TX 78235
SAMPLE IDENTITY WATER Well No. 1	DATE RECEIVED 27 Mar 84
SAMPLE FROM Otis ANG Base, MA	LAB CONTROL NR
TEST FOR VOLATILE AROMATICS	

METHODOLOGY: EPA 602

OEHL #	16490	16491	16492	16493	16494
BASE #	GN840226	GN840227	GN840228	GN840229	GN840230
BENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
CHLOROBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
1,2-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,3-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,4-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
ETHYLBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
TOLUENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LEROY P. GEORGE
Chief, Trace Organics Section

ERIC A. BANKS, 1Lt, USAF
Chemist, Trace Organics Section

REQUESTING AGENCY (Mailing Address)

USAF OEHL/ECQ
BROOKS AFB TX 78235

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 24 Apr 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY: WATER Well No. 2

DATE RECEIVED: 27 Mar 84

SAMPLE FROM: Otis ANG Base, MA

LAB CONTROL NR:

TEST FOR: VOLATILE HALOCARBONS

METHODOLOGY: EPA METHOD 601

OEHL #	16475	16476	16477	16478	16479	DET.
BASE #	GN840211	GN840212	GN840213	GN840214	GN840215	LIMIT
Bromodichloromethane	ND	ND	ND	ND	ND	0.1
Bromoform	ND	ND	ND	ND	ND	0.2
Bromomethane	ND	ND	ND	ND	ND	1.0
Carbon Tetrachloride	ND	ND	ND	ND	ND	0.1
Chlorobenzene	ND	ND	ND	ND	ND	0.2
Chloroethane	ND	ND	ND	ND	ND	0.5
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	0.1
Chloroform	ND	ND	ND	ND	ND	0.1
Chloromethane	ND	ND	ND	ND	ND	0.1
Dibromochloromethane	ND	ND	ND	ND	ND	0.1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
Dichlorodifluoromethane	ND	ND	ND	ND	ND	0.1
1,1-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,2-Dichloroethane	ND	ND	ND	1.7	ND	0.2
1,1-Dichloroethene	ND	ND	ND	ND	ND	0.1
trans-1,2-Dichloroethene	6.8	41	25	89	12	0.1
1,2-Dichloropropane	ND	ND	ND	ND	ND	0.1
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
Methylene Chloride	ND	ND	ND	ND	ND	0.2
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	0.1
Tetrachloroethylene	1.6	4.4	2.2	4.5	2.4	0.1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	0.1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	0.1
Trichloroethylene	ND	ND	ND	1.5	ND	0.1
Trichlorofluoromethane	ND	ND	ND	ND	ND	0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LeROY P. GEORGE, GS-12
Chief, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

BROOKS AFB TX

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*	DATE 25 Apr 84
TO:	FROM: USAF OEHL/SA Brooks AFB TX 78235
SAMPLE IDENTITY WATER Well No. 2	DATE RECEIVED 27 Mar 84
SAMPLE FROM Otis ANG Base, MA	LAB CONTROL NR
TEST FOR VOLATILE AROMATICS	

METHODOLOGY: EPA 602

OEHL #	16480	16481	16482	16483	16484
BASE #	GN840216	GN840217	GN840218	GN840219	GN840220
BENZENE	ND<1.0	ND<1.0	1.6	ND<1.0	ND<1.0
CHLOROBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
1,2-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,3-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,4-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
ETHYLBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
TOLUENE	1.1	ND<1.0	ND<1.0	ND<1.0	ND<1.0

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LEROY P. GEORGE
Chief, Trace Organics Section

ERIC A. BANKS, 1Lt, USAF
Chemist, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

USAF OEHL/ECQ
BROOKS AFB TX 78235

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 24 Apr 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY: WATER Well No. 3

DATE RECEIVED: 27 Mar 84

SAMPLE FROM: Otis ANG Base, MA

LAB CONTROL NR:

TEST FOR: VOLATILE HALOCARBONS

METHODOLOGY: EPA METHOD 601

OEHL #	16465	16466	16467	16468	16469	DET.
BASE #	GN840201	GN840202	GN840203	GN840204	GN840205	LIMIT
Bromodichloromethane	ND	ND	ND	ND	ND	0.1
Bromoform	ND	ND	ND	ND	ND	0.2
Bromomethane	ND	ND	ND	ND	ND	1.0
Carbon Tetrachloride	ND	ND	ND	ND	ND	0.1
Chlorobenzene	ND	ND	ND	ND	ND	0.2
Chloroethane	ND	ND	ND	ND	ND	0.5
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	0.1
Chloroform	ND	ND	ND	ND	ND	0.1
Chloromethane	ND	ND	ND	ND	ND	0.1
Dibromochloromethane	ND	ND	ND	ND	ND	0.1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
Dichlorodifluoromethane	ND	ND	ND	ND	ND	0.1
1,1-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,2-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,1-Dichloroethene	ND	ND	ND	ND	ND	0.1
trans-1,2-Dichloroethene	61	67	68	99	135	0.1
1,2-Dichloropropane	ND	ND	ND	ND	ND	0.1
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
Methylene Chloride	ND	ND	ND	ND	ND	0.2
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	0.1
Tetrachloroethylene	4.5	4.8	5.5	7.7	8.0	0.1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	0.1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	0.1
Trichloroethylene	ND	ND	ND	1.1	1.3	0.1
Trichlorofluoromethane	ND	ND	ND	ND	ND	0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LeROY P. GEORGE, GS-12
Chief, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

BROOKS AFB TX

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*	DATE 25 Apr 84
TO:	FROM: USAF OEHL/SA Brooks AFB TX 78235
SAMPLE IDENTITY WATER Well no. 3	DATE RECEIVED 27 Mar 84
SAMPLE FROM Otis ANG Base, MA	LAB CONTROL NR
TEST FOR VOLATILE AROMATICS	

METHODOLOGY: EPA 602

OEHL #	16470	16471	16472	16473	16474
BASE #	GN840206	GN840207	GN840208	GN840209	GN840210
BENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
CHLOROBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
1,2-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,3-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,4-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
ETHYLBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
TOLUENE	ND<1.0	1.1	ND<1.0	2.0	ND<1.0

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LEROY P. GEORGE
Chief, Trace Organics Section

ERIC A. BANKS, 1Lt, USAF
Chemist, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

USAF OEHL/ECQ
BROOKS AFB TX 78235

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*	DATE 24 Apr 84
TO:	FROM: USAF OEHL/SA Brooks AFB TX 78235
SAMPLE IDENTITY WATER Well No. 4	DATE RECEIVED 27 Mar 84
SAMPLE FROM Otis ANG Base, MA	LAB CONTROL NR
TEST FOR VOLATILE HALOCARBONS	

METHODOLOGY: EPA METHOD 601

OEHL #	16455	16456	16457	16458	16459	DET.
BASE #	GN840191	GN840192	GN840193	GN840194	GN840195	LIMIT
Bromodichloromethane	ND	ND	ND	ND	ND	0.1
Bromoform	ND	ND	ND	ND	ND	0.2
Bromomethane	ND	ND	ND	ND	ND	1.0
Carbon Tetrachloride	ND	ND	ND	ND	ND	0.1
Chlorobenzene	ND	ND	ND	ND	ND	0.2
Chloroethane	ND	ND	ND	ND	ND	0.5
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	0.1
Chloroform	ND	ND	ND	ND	ND	0.1
Chloromethane	ND	ND	ND	ND	ND	0.1
Dibromochloromethane	ND	ND	ND	ND	ND	0.1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
Dichlorodifluoromethane	ND	ND	ND	ND	ND	0.1
1,1-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,2-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,1-Dichloroethene	ND	ND	ND	ND	ND	0.1
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	0.1
1,2-Dichloropropane	ND	ND	ND	ND	ND	0.1
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
Methylene Chloride	ND	ND	ND	ND	ND	0.2
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	0.1
Tetrachloroethylene	2.1	2.3	1.4	1.8	2.8	0.1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	0.1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	0.1
Trichloroethylene	4.6	4.0	2.6	4.2	5.0	0.1
Trichlorofluoromethane	ND	ND	ND	ND	ND	0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LeROY P. GEORGE, GS-12
Chief, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

BROOKS AFB TX

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*

DATE: 25 Apr 84

TO:

FROM: USAF OEHL/SA
Brooks AFB TX 78235

SAMPLE IDENTITY: WATER Well No. 4

DATE RECEIVED: 27 Mar 84

SAMPLE FROM: Otis ANG Base, MA

LAB CONTROL NR:

TEST FOR: VOLATILE AROMATICS

METHODOLOGY: EPA 602

OEHL #	16460	16461	16462	16463	16464
BASE #	GN840196	GN840197	GN840198	GN840199	GN840200
BENZENE	2.1	1.7	ND<1.0	1.3	ND<1.0
CHLOROBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
1,2-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,3-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,4-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
ETHYLBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
TOLUENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LEROY P. GEORGE
Chief, Trace Organics Section

ERIC A. BANKS, 1Lt, USAF
Chemist, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

USAF OEHL/ECQ
BROOKS AFB TX 78235

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*	DATE 24 Apr 84
TO:	FROM: USAF OEHL/SA Brooks AFB TX 78235
SAMPLE IDENTITY WATER Well No. 5	DATE RECEIVED 27 Mar 84
SAMPLE FROM Otis ANG Base, MA	LAB CONTROL NR
TEST FOR VOLATILE HALOCARBONS	

METHODOLOGY: EPA METHOD 601

OEHL #	16445	16447	16448	16449	16450	DET.
BASE #	GN840181	GN840183	GN840184	GN840185	GN840186	LIMIT
Bromodichloromethane	ND	ND	ND	ND	ND	0.1
Bromoform	ND	ND	ND	ND	ND	0.2
Bromomethane	ND	ND	ND	ND	ND	1.0
Carbon Tetrachloride	ND	ND	ND	ND	ND	0.1
Chlorobenzene	ND	ND	ND	ND	ND	0.2
Chloroethane	ND	ND	ND	ND	ND	0.5
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	0.1
Chloroform	ND	ND	ND	ND	ND	0.1
Chloromethane	ND	ND	ND	ND	ND	0.1
Dibromochloromethane	ND	ND	ND	ND	ND	0.1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	0.2
Dichlorodifluoromethane	ND	ND	ND	ND	ND	0.1
1,1-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,2-Dichloroethane	ND	ND	ND	ND	ND	0.2
1,1-Dichloroethene	ND	ND	ND	ND	ND	0.1
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	0.1
1,2-Dichloropropane	ND	ND	ND	ND	ND	0.1
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.2
Methylene Chloride	ND	ND	ND	ND	ND	0.2
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	0.1
Tetrachloroethylene	ND	ND	ND	ND	ND	0.1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	0.1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	0.1
Trichloroethylene	ND	ND	ND	ND	ND	0.1
Trichlorofluoromethane	ND	ND	ND	ND	ND	0.1
Vinyl Chloride	ND	ND	ND	ND	ND	0.2

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LeROY P. GEORGE, GS-12
Chief, Trace Organics Section

REQUESTING AGENCY *(Mailing Address)*

USAF OEHL/ECQ
BROOKS AFB TX 78235

AMD FORM SEP 82 641 REPLACES OEHL FORM 7, DEC 78, WHICH IS OBSOLETE.

LABORATORY ANALYSIS REPORT AND RECORD *(General)*	DATE 25 Apr 84
TO:	FROM: USAF OEHL/SA Brooks AFB TX 78235
SAMPLE IDENTITY WATER Well No. 5	DATE RECEIVED 27 Mar 84
SAMPLE FROM Otis ANG Base, MA	LAB CONTROL NR
TEST FOR VOLATILE AROMATICS	

METHODOLOGY: EPA 602

OEHL #	16446	16451	16452	16453	16454
BASE #	GN840182	GN840187	GN840188	GN840189	GN840190
BENZENE	2.5	ND<1.0	1.9	2.5	2.2
CHLOROBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
1,2-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,3-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
1,4-DICHLOROBENZENE	ND<2.0	ND<2.0	ND<2.0	ND<2.0	ND<2.0
ETHYLBENZENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0
TOLUENE	ND<1.0	ND<1.0	ND<1.0	ND<1.0	ND<1.0

RESULTS IN MICROGRAMS PER LITER
ND - NONE DETECTED, LESS THAN THE DETECTION LIMIT
TRACE - PRESENT BUT LESS THAN THE QUANTITATIVE LIMIT

LEROY P. GEORGE
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ERIC A. BANKS, 1Lt, USAF
Chemist, Trace Organics Section

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